

Amendments to the specification:

Please amend page 1, ll. 5-21 as follows:

The present invention provides a novel and simple method for efficiently producing chlorinated hydrocarbons from aromatic-substituted alcohol compounds. The present invention also relates to a method for producing a chlorinated hydrocarbon by selectively chlorinating a tertiary carbon in a hydrocarbon compound with a hypochlorite compound. Such chlorinated hydrocarbons produced according to the present invention are useful as reagents for various synthetic reactions due to their reactive chlorine-substituted groups. It is known that aromatic-substituted chlorinated hydrocarbons, such as 1,4-bis(1-chloro-1-methylethyl)benzene ~~1,4-bis(2-chloro-2-propyl)benzene~~ [1,4-dicumyl chloride, $p\text{-Cl}(\text{CH}_3)_2\text{CC}_6\text{H}_4\text{C}(\text{CH}_3)_2\text{Cl}$], are used as cationic polymerization initiators in producing polyisobutylene having terminal functional groups or block copolymers each containing a block component composed of polyisobutylene, for example, styrene-isobutylene-styrene copolymers [United States Patent Nos. 4,276,394 and 5,527,870 (Maeda et al. 1994)].

Please amend page 1, l. 26 – page 2, l. 7, as follows:

In one process, 1,4-diisopropenylbenzene ($\text{CH}_2=(\text{CH}_3)\text{CC}_6\text{H}_4\text{C}(\text{CH}_3)=\text{CH}_2$) is prepared by dehydrogenation (United States Patent No. 3,429,941) and then undergoes addition reaction with hydrogen chloride (O. Nuyken et al., Makromol. Chem., 186, 173 (1985)). In another process, 1,4-bis(1-hydroxy-1-methylethyl)benzene ~~1,4-bis(2-hydroxy-2-propyl)benzene~~ ($1,4\text{-HO}(\text{CH}_3)_2\text{CC}_6\text{H}_4\text{C}(\text{CH}_3)_2\text{OH}$) is prepared by air oxidation (for example, Japanese Unexamined Patent Application Publication No. 60-174737) and is then allowed to react with hydrogen chloride (V. S. C. Chang et al., Polymer Bulletin, 4, 513 (1981)).

Please amend page 2, l. 28 – page 3, l. 5, as follows:

The present inventors found a process for simply producing dicumyl chloride or the like in high yield by allowing an alcohol compound, such as 1,4-bis(1-hydroxy-1-

~~methylethyl)benzene 1,4-bis(2-hydroxy-2-propyl)benzene, 1,4-~~
HO(CH₃)₂CC₆H₄C(CH₃)₂OH, to react with hydrochloric acid (Japanese Unexamined
Patent Application Publication Nos. 8-291090 and 10-175892).

Please amend page 7, ll. 1-4, as follows:

According to a preferred embodiment, the production method is characterized in
that the compound represented by general formula (1) is an aromatic hydrocarbon
containing a ~~2-hydroxy-2-propyl~~ 1-hydroxy-1-methylethyl substituent.

Please amend page 9, ll. 11-18, as follows:

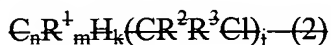
Examples of the aromatic-substituted alcohol represented by general formula (1)
include (1-hydroxy-1-methylethyl)benzene ~~(2-hydroxy-2-propyl)benzene~~
C₆H₅C(CH₃)₂OH, 1,4-bis(1-hydroxy-1-methylethyl)benzene ~~1,4-bis(2-hydroxy-2-~~
~~propyl)benzene~~ 1,4-HO(CH₃)₂CC₆H₄C(CH₃)₂OH, 1,3-bis(1-hydroxy-1-
methylethyl)benzene ~~1,3-bis(2-hydroxy-2-propyl)benzene~~ 1,3-
HO(CH₃)₂CC₆H₄C(CH₃)₂OH, 1,3,5-tris(1-hydroxy-1-methylethyl)benzene ~~1,3,5-tris(2-~~
~~hydroxy-2-propyl)benzene~~ 1,3,5-((C(CH₃)₂OH)₃C₆H₃), and 1,3-bis(1-hydroxy-1-
methylethyl)-5-(tert-butyl)benzene ~~1,3-bis(2-hydroxy-2-propyl)-5-(tert-butyl)benzene~~
1,3-((HOC(CH₃)₂)₂-5-(C(CH₃)₃)C₆H₃).

Please amend page 11 to delete the 8 chemical structures. They are
redundant to the structures on page 12.

Please amend page 11, ll. 2-8 as follows:

[0027]

~~The present invention provides a chlorinated hydrocarbon compound~~
~~represented by general formula (2):~~



(where m, n, k, j, R^1 , R^2 , and R^3 are the same as above) is provided by the present invention. ~~Preferable examples of the compound include the following:~~

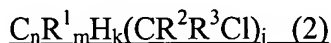
Preferable examples of a compound represented by general formula (3) of the present invention include the following:

Please amend page 13 to delete the 8 chemical structures. They are redundant to the structures on page 14.

Please amend page 13, ll. 3-4 as follows:

~~Preferable examples of a compound represented by general formula (3) of the present invention include the following:~~

The present invention provides a chlorinated hydrocarbon compound represented by general formula (2):



(where m, n, k, j, R^1 , R^2 , and R^3 are the same as above) is provided by the present invention. Preferable examples of the compound include the following:

Please amend page 25, l. 20 – page 26, l. 12 as follows:

(EXAMPLE 1)

To a conical beaker were fed 0.14 kg of toluene and 0.03 kg of 1,4-bis(1-hydroxy-1-methylethyl)benzene ~~1,4 bis(2-hydroxy 2-propyl)benzene~~ (*p*-DIOL, manufactured by MITSUI PETROCHEMICAL Co., LTD.) and then added 0.25 kg of 35 wt% aqueous hydrochloric acid. This resulting mixture was stirred with a magnetic stirrer for 90 minutes at 20°C. At this time, both of organic and aqueous layers changed to transparent and colorless. After the organic layer was separated from the aqueous layer, a hydrogen chloride gas was bubbled through the organic layer for 90 minutes at 20°C under stirring with the magnetic stirrer. Then, in order to remove hydrogen chloride, a nitrogen gas was bubbled for 45 minutes. A sample solution of the resulting toluene solution of 1,4-bis(1-chloro-1-methylethyl)benzene ~~1,4 bis(2-chloro-2-propyl)benzene~~ (*p*-DCC) was devolatilized by distillation. The subsequent

measurement of a ^1H -NMR spectrum of the resulting *p*-DCC (crude) showed a purity of 99.5%. The resulting solution of *p*-DCC had high quality comparable to *p*-DCC produced by crystallization from an organic layer instead of contact with hydrogen chloride gas and drying, and was able to be satisfactorily used as an initiator for cationic polymerization.

Please amend page 26, l. 25 – page 29, l. 24, as follows:

(EXAMPLE 3)

To a glass separable flask, having a capacity of 0.002 m^3 , equipped with a thermometer, a baffle, and a stirrer were added 1,4-diisopropylbenzene (0.045 kg), monochlorobenzene (0.03 kg), and an aqueous solution of sodium hypochlorite (1.2 kg, 0.9 mol/kg) under stirring and cooling in an ice bath. Subsequently, concentrated aqueous hydrochloric acid (0.08 kg, 35 percent by weight) was slowly added dropwise to the solution through a dropping funnel over a period of 3 minutes and stirring was continued for 60 minutes. After the reaction, the organic layer and the aqueous layer was separated by standing. To the separated organic layer was added concentrated hydrochloric acid (0.03 kg, 35 percent by weight), and then the resulting mixture was vigorously stirred for about 5 minutes to deactivate the hypochlorous acid finely dispersed in the organic layer. The resulting organic layer was separated to obtain a monochlorobenzene solution of the reaction product. The yield of 1,4-bis(1-chloro-1-methylethyl)benzene ~~1,4-bis(2-chloro-2-propyl)benzene~~ in the product was determined by gas chromatography (hereinafter, referred to as "GC") analysis (yield: 60.0%).

To the same flask that was cleaned were added the separated monochlorobenzene solution, 0.04 kg of hexane, and 1 kg of an aqueous solution containing 2 wt% sodium hydroxide, and then stirring was continued for 5 hours at 60°C . The aqueous layer was alkaline through the reaction. This hydrolysis reaction provided 1,4-bis(1-hydroxy-1-methylethyl)benzene ~~1,4-bis(2-hydroxy-2-propyl)benzene~~ with a selectivity of about 90%.

Subsequently, the resulting solid was washed with hexane and pure water and

then stirred in the presence of 0.3 kg of 35 wt% concentrated hydrochloric acid and 0.05 kg of toluene to yield 1,4-bis(1-chloro-1-methylethyl)benzene ~~1,4-bis(2-chloro-2-propyl)benzene~~. The purity determined by NMR was 95%. The ultimate yield was 45%.

(EXAMPLE 4)

The target compound was produced as in EXAMPLE 3 except that, in alcoholization, the reaction temperature was 50°C, and the reaction time was 8 hours. The alcoholization provided 1,4-bis(1-hydroxy-1-methylethyl)benzene ~~1,4-bis(2-hydroxy-2-propyl)benzene~~ with a selectivity of about 90%. The subsequent operation was performed as in EXAMPLE 3 to yield 1,4-bis(1-chloro-1-methylethyl)benzene ~~1,4-bis(2-chloro-2-propyl)benzene~~ at the end. The purity determined by NMR was 95%. The ultimate yield was 45%.

(EXAMPLE 5)

The target compound was produced as in EXAMPLE 3 except that the aqueous solution of 1 wt% sodium hydroxide was first added and the aqueous solution of 25 wt% sodium hydroxide was added in an amount of 0.04 kg after the confirmation that the aqueous layer showed acidic pH. The alcoholization provided 1,4-bis(1-hydroxy-1-methylethyl)benzene ~~1,4-bis(2-hydroxy-2-propyl)benzene~~ with a selectivity of about 90%. The subsequent operation was performed as in EXAMPLE 3 to yield 1,4-bis(1-chloro-1-methylethyl)benzene ~~1,4-bis(2-chloro-2-propyl)benzene~~ at the end. The purity determined by NMR was 95%. The ultimate yield was 45%.

(EXAMPLE 6)

The target compound was produced as in EXAMPLE 3 except that, instead of hexane, toluene was used as both the organic solvent added during alcoholization and the organic solvent for washing the formed solid and the reaction temperature was set at 75°C. The alcoholization provided 1,4-bis(1-hydroxy-1-methylethyl)benzene ~~1,4-bis(2-~~

~~hydroxy-2-propyl)benzene~~ with a selectivity of about 70%.

The purity, which was determined by NMR, of 1,4-bis(1-chloro-1-methylethyl)benzene ~~1,4-bis(2-chloro-2-propyl)benzene~~ was 95%. The ultimate yield was 35%.

(EXAMPLE 7)

Subsequently to EXAMPLE 3, a hydrogen chloride gas was bubbled through the toluene solution of 1,4-bis(1-chloro-1-methylethyl)benzene ~~1,4-bis(2-chloro-2-propyl)benzene~~, which was the solution obtained at the end, under stirring with a magnetic stirrer for 1.5 hours at 25°C. As a result, 1,4-bis(1-chloro-1-methylethyl)benzene ~~1,4-bis(2-chloro-2-propyl)benzene~~ finally obtained had a purity of 99.5% determined by NMR. The ultimate yield was about 50%.

(EXAMPLE 8)

Subsequently to EXAMPLE 3, a hydrogen chloride gas was bubbled through the toluene solution of 1,4-bis(1-chloro-1-methylethyl)benzene ~~1,4-bis(2-chloro-2-propyl)benzene~~, which was the solution obtained at the end, for 1.5 hours at 5°C. As a result, 1,4-bis(1-chloro-1-methylethyl)benzene ~~1,4-bis(2-chloro-2-propyl)benzene~~ finally obtained had a purity of 99.0% determined by NMR. The ultimate yield was about 50%.

Please amend page 30, ll. 9-14, as follows:

(COMPARATIVE EXAMPLE 3)

In EXAMPLE 3, hexane was added alone instead of hexane and the aqueous solution of 2 wt% sodium hydroxide, followed by cooling crystallization. The purity of 1,4-bis(1-chloro-1-methylethyl)benzene ~~1,4-bis(2-chloro-2-propyl)benzene~~ in the dry crystals obtained was determined to be 90% by NMR. The ultimate yield was 30%.